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*g* and *k* may be bent. Fig. 10 is an end view of standard *i*, shewing the two studs *jj* on it, the three rollers under it, and the station-stud *c*. Fig. 11 is an edge view of the bar *e*, shewing the tracer *a*, and ivory foot near it: there are two of these feet, one at each end of the limb *b*. Fig. 12 is an edge view of bar *m m*, shewing the joint on which it turns at bottom of the screw *s*. This screw has a flat part to slide in the groove of the limb *b*; it rises half-through. The collet also has a flat part going the other half through, and an index *w*, which nearly touches the divisions *l s*, seen in fig. 1, near any of which it is bound fast by a screw-nut at top.

There are four different heights in which the bars lie so as to clear each other. The bar *d d* is lowest; in the second plane lie *k, g, and h*, and *i, j, j*; in the third lie *m m*; in the fourth and last, *l, e, e*. The different rollers, feet, and studs, are therefore made of proper heights to keep all the bars level.

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## No. II.

### DISCOVERY OF LITHOGRAPHIC LIMESTONE IN INDIA.

*The Thanks of the Society were voted to ROBERT SMITH, Esq. of Calcutta, for his Communication respecting the Lithographic Limestone of Jaisalmír, a small sample of which, together with various Lithographic Impressions, are in the Society's Repository.*

SIR,

Calcutta, 25th March, 1831.

I AM not sure that I am strictly in rule in addressing you thus; but, considering that the Society have been the

means of recording many useful inventions, I come before them with confidence, trusting that the merits of the case are all that is requisite to insure their favourable consideration. Referring to the specimen of Asiatic Lithographic Stone, with the impressions produced from it, and the article relating to it in the local publication called the "Gleanings in Science," all herewith accompanying, you will perceive that I come before the Society as an individual who lays claim to the merit of introducing an improvement into the lithographic art, by employing a substitute for the German stone, for which, until this period, both in England and in this country, the art has been entirely dependent on foreign supply.

Though now, and for some years past, an uncovenanted servant of the government at this Presidency, I am well acquainted with the lithographic art, having acquired it in London many years ago, and consequently am competent to form an opinion as to the advantages likely to accrue from the introduction of the new material.

I leave the impressions now submitted to their own merits; they may not be considered very superior, but if they prove the adaptation of the stone to the purpose intended, I trust my case is fully made out.

I do not transmit this letter with the view of pecuniary reward; but should the Society deem me worthy the honour of the enrolment of my name amongst its members, that would be the highest gratification I could possibly enjoy, in return for the time and labour expended in successfully bringing to perfection an obvious improvement in a branch of the Fine Arts now so extensively cultivated.

In conclusion, permit me to explain, that the officer mentioned in the "Gleanings" as having first discovered

the stone, in a letter recently received, has very kindly permitted me to claim the credit of the introduction of the material, by expressing himself to the following effect: —

“ You are at liberty to make use of my name as having discovered the material, when sending any of it home, but I have no claim to any thing further ; and, as your experience in the art of printing is fully borne out to be very great, by the excellence of the specimens produced, any account of the treatment of the stone during the several processes, will be done much more justice to by your pen than it can by mine.”

I am, Sir, &c. &c.

A. AIKIN, *Esq.*

ROBERT SMITH.

*Secretary, &c. &c.*

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The following is an extract from Mr. Smith's Paper on the Jaísalmír Lithographic Limestone, published in the “ Gleanings : ” —

“ The Jaísalmír limestone, which is found in detached masses forming the summits of hills, resting on sandstone, is of an ochre yellow, or, when polished, of a reddish brown colour. It breaks with a sub-conchoidal fracture in the large, having thin, flinty, and ragged edges ; the fracture in the small is uneven. The texture, or composition, as it is sometimes called, is fine granular, something like that of the finest sandstones, but with shining facets, interspersed so as to give it a semi-crystallised appearance. It frequently contains organic remains. It is harder, more sonorous, and more brittle than pure limestone ; and yet, by the following analysis, it appears to be little else. Its specific gravity was found to be 2.61 in an

ordinary state of the atmosphere ; or when saturated with water, of which it took up .5 per cent, 2.66.

“ The following analysis was kindly furnished by James Prinsep, Esq, of the Calcutta Mint :—

Carbonate of lime	-	-	-	-	-	97.5
Yellow ochreous earth, similar in appearance to bole,						2.5
						<hr/>
						100.

2 per cent of moisture had been previously driven off.

“ Traces of magnesia were carefully sought for, but without success.

“ The above analysis is sufficient to shew, that our Indian stone, though not an argillaceous limestone, which is the proper character of the best lithographic stones, has yet, in its freedom from magnesia, a claim on our attention. This freedom from magnesia, with the peculiarity of its grain, fit it for every ordinary sort of work ; and, except in the chalk department, it will be found a very useful material to the Indian lithographer.

“ In preparing the Jaísalmír stone for use, no variation takes place in the usual process observed in lithography. The chemical and printing inks, the transfer-paper, and other parts of the manipulation, are the same as when using the German stone. There is, however, one exception which requires careful observation, for on it depends the success of the whole operation. The *sleek stone* and pumice, generally used in polishing the German stone, will not bring the Jaísalmír material to that high degree of polish absolutely requisite for a surface on which transfer is to be made. Unless the Jaísalmír stone be brought to a high pitch of polish, good impressions are not to be expected from it. As this part of the process differs widely from the usual practice, it will be here

minutely detailed, commencing at the point when a rough-trimmed slab is supposed to be laid out for the purpose of grinding and polishing: the lithographer, in practice, will, however, only be concerned with the latter; the former being the work of the lapidary, and only requisite when the slabs are first brought from the quarry.

*“ Method of Grinding and Polishing the Jaísalmír Stone.*

“ The slab of Jaísalmír stone to be polished, after the inequalities have been removed by the common stone-cutter’s tool called the *point*, is brought to a general level by chiselling furrows across it, in a direction parallel to its sides, about  $1\frac{1}{2}$  inch apart, so that the surface, in this state, has a checkered appearance; the intervals or squares formed by the furrows being somewhat raised: these are reduced afterwards to the level of the furrows, and the stone is now ready for the operation of grinding, which may be divided into three separate heads:—1st, the rough grinding; 2d, the smoothing; and 3d, the polishing.

“ The rough grinding is performed with a gritstone rubber, and the surface of the stone is, during the operation, kept constantly wet: the larger the surface of the rubber the more perfectly will the surface of the slab be reduced. This operation is continued until all the marks of the chisel have entirely disappeared; then the smoothing is commenced, with rubbers made of common lac and corundum, generally of three kinds: viz. coarse, medium, and fine. The method of preparing these will be described hereafter. Their application is similar in all respects to that of the gritstone rubber; the surface of the slab being kept constantly wet. It must be observed, however, that no one rubber is to be changed for a finer one until it has entirely effaced the scratches made by the one used imme-

diately before it, which may be easily ascertained by observing whether the surface of the slab appears uniform all over; for as the marks made by the coarse rubbers will be larger than those of the finer ones, their presence on the surface will be readily detected. The operation of the fine rubber must be continued until the surface assumes a glossy or pearly appearance, when it is nearly ready for polishing. Should any scratches appear, they must be removed by using the coarse corundum rubber again; and until this be effected a perfect polish can never be given.

“ The last operation, that of polishing, is performed with tin putty, a small quantity of which is laid upon the surface of the slab, and a few drops of water are added. This is to be well rubbed in with a pad made of 4 or 5 folds of fine calico, renewing the calcined tin, and adding, occasionally, a few drops of water, as may seem necessary. The longer this operation is continued the more perfect will the polish be.

“ The grinding and smoothing need only be performed when the stone has to be wrought from a rough state. Any two slabs once reduced may be rubbed together; and it will merely be necessary, when they are sufficiently ground, to use the fine corundum rubbers to give the surface the pearly appearance before the polishing is commenced.

“ *Note.*—That in making the furrows, when levelling the surface, it is usual first to cover the stone over with some colour (generally red ochre and water), that the part which has been submitted to the operation of the chisel may be distinguished from that which has not; in white marble this is indispensable, for those parts which have been gone over cannot otherwise be distinguished; and a good level can never be given to any very light-coloured marble without this precaution.

*“ The Corundum Rubbers.*

“ The proportions generally used in making the corundum rubbers are, for the coarse, lac 8, corundum 1; for the medium, lac 12 to 16, and corundum 1, by weight. The fine rubber is made by mixing the grindings of agates, cornelians, and the like, with lac; and as the lapidaries' wheels, upon which they are ground, are made of corundum and lac also, the grindings must contain a portion of those materials; their proportion, in composition, must vary according to the nature of the stone from which they are ground; but 6 of lac to 1 of grindings may be considered a good proportion generally. The lac is first melted, and the corundum, after it has been reduced to a powder, mixed intimately with it; the composition is then moulded in the shape of a brick (about  $6 \times 4 \times 1\frac{1}{2}$  inch), with a handle of wood, about 6 inches long at one end, having a rise of about 30 degrees for the convenience of working it.

“ Having thus given a detail of the introduction of the Jaísalmír stone, I should be wanting in candour were I not to explain, that I lay no claim to the original discovery of the material; that credit is due to an officer of engineers,\* who sent it to Calcutta, with many others, to be experimented upon. I am satisfied with being the first individual who has brought into use a substitute for the German stone—a point long aimed at in Europe, and where, at this moment, they are engaged in attempting to make artificial cements to answer the same purpose.

“ From numerous specimens of stones which, from time to time, have been sent to me for experiment, I have

\* “ Lieut. J. T. Boileau, executive engineer, Agra.”



little doubt that a stone possessed of qualities similar to the German will ultimately be found in the lias formation of Bundelkhund, or on the Sylhet frontier; perhaps also in Tenasserim.

“ A stone from the neighbourhood of Masulipatam, transmitted by the Private Secretary to the Governor-General, is possessed of lithographic properties, and tolerable impressions have been produced from it; but as the magnesia in its composition is in excess, it is difficult to keep a clean surface, or to prevent *shading* while printing from it.”

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The sample of the substance sent to the Society by Mr. Smith is much too small to be submitted to experiment. Judging from the specimen which accompanied the communication, it is scarcely fit to be used for fine works of art; but gives very good impressions of Arabic, Persian, and other oriental written characters.